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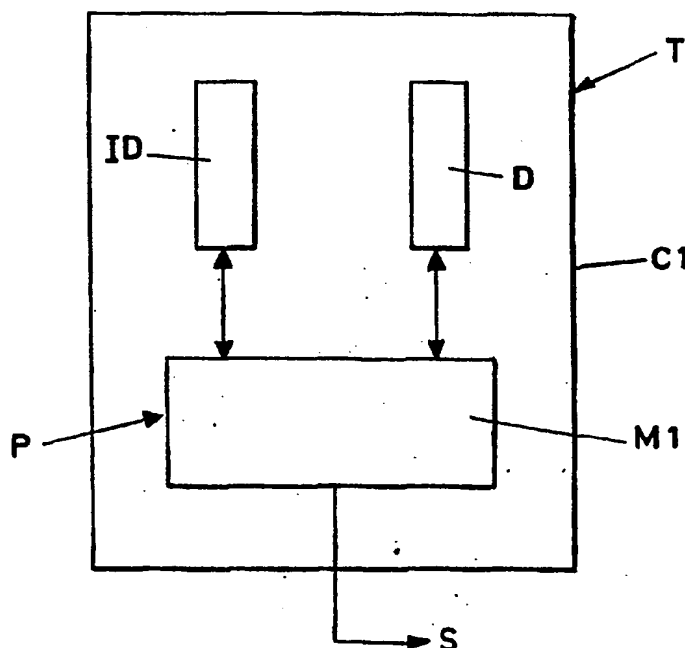
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(54) Title: ELECTRONIC DEVICE FOR THE OPERATION OF UTILITIES SUCH AS BURGLAR-ALARM UNITS, DOOR-OPENERS, SWITCHES AND SO ON

(57) Abstract

The device comprises a transmitter (T) and a receiver (R). The transmitter (T) comprises one non-rewritable memory (ID) for storing a fixed identification code, a rewritable memory (D) for storing a variable transmission code and a microprocessor (M1) with a preset algorithm for the formation and emission of a string of data containing said codes. The receiver (R) comprises at least one memory (ID1-IDn) for storing at least one fixed identification code, at least one rewritable memory (D1-Dn) for storing at least one variable transmission code coincident with a previous variable transmission code received from the receiver and a microprocessor (M2) with a preset algorithm for comparing the string of data received with said identification code and said variable transmission code stored in said memories (ID1-IDn; D1-Dn) of the receiver. Both memories (ID, D) of the transmitter (T) are included together with the corresponding microprocessor (M1) inside a single sealed container (C1) suitable for preventing access to the algorithm of said microprocessor (M1) and to the content of said memories (ID, D).



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"Electronic device for the operation of utilities such as burglar-alarm units, door-openers, switches and so on."

* * * * *

D E S C R I P T I O N

5 The present invention relates to an electronic device for, the remote-controlled or direct-contact operation of utilities such as burglar-alarm units, door-openers, switches and so on.

As is well-known, remote-control electronic devices, usually known as "remote control devices", consist of a signal
10 transmitter and of a signal receiver usually, but not necessarily, connected by wireless.

A problem common of such devices is that of assigning a code to the signals emitted by a given transmitter that is well defined and unknown to unauthorised persons, so that that
15 particular transmitter operates only the receiver to which it is linked and the latter responds only to the signals issued by the transmitter or transmitters associated with it.

For this purpose transmitters have been developed based on a microprocessor with a corresponding algorithm which, whenever
20 it is activated, takes from an EEPROM-type rewritable memory an identification code of the transmitter and a dynamic transmission code that varies with a preset cyclic sequence from one transmission to another and, through a special and secret process, inserts them in a string of data that is
25 transmitted by wireless, by optical means, by telephone, by direct contact and so on to be received and recognized by the receiver to which it is destined.

The receiver in turn comprises a microprocessor with a corresponding algorithm, which is capable of comparing the two
30 codes contained in the incoming string of data with one or more

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5 preset identification codes and with as many dynamic transmission codes, all contained in a single EEPROM memory, so as to verify that the identification code received coincides with one of those memorised and the transmission code is one of those immediately subsequent to the one received on the occasion of the preceding transmission.

10 In this way it is certain that the receiver receives and executes only a signal transmitted by a transmitter that is linked with it, rejecting any other signal originating from another transmitter.

15 The greatest problem that the manufacturers of such remote-control devices are obliged to tackle is that of preventing unauthorised people from obtaining from a given transmitter the identity of the two codes and from them, by comparing the transmitter's output signal, the characteristics of the algorithm in use. At this point it would be easy to reproduce the transmitter in any number of specimens.

20 This problem is at this time unresolved in transmitters of the type mentioned above, since the EEPROM memory can be read and access to the transmitted codes is thus easy.

25 In addition, the use of a single rewritable memory makes it possible to change the identification code written in the memory itself, either by design or through the effect of simple external disturbances.

30 This latter drawback can be found in the receiver as well, where the continuous exchange of information between the microprocessor and the rewritable memory to update the memorised transmission code can lead to the alteration of the identification codes stored at installation.

 In view of this state of the art, the object of the present

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invention is to provide an electronic device for the operation of utilities such as burglar-alarm units, door-openers, switches and so on, that exhibits the same structural and functional features of the known device described above, but that is exempt from the current drawbacks of accessibility to
5 and alteration of the identification codes.

According to the invention such object is attained with a device formed by a transmitter and by a receiver, the transmitter comprising at least one memory for storing a fixed
10 identification code and a variable transmission code and a microprocessor with a preset algorithm for the formation and emission of a string of data containing said codes, the receiver comprising at least one memory for storing at least one fixed identification code and at least one variable
15 transmission code coincident with a previous variable transmission code received from the receiver and a microprocessor with a preset algorithm for comparing the string of data received with said identification code and said variable transmission code stored in said memory of the
20 receiver, characterized in that said memory of the transmitter is constituted by a non-rewritable memory for said identification code and by a rewritable memory for said variable transmission code, both memories being included together with said microprocessor of the transmitter inside a
25 single sealed container suitable for preventing access to the algorithm of said microprocessor and to the content of said memories.

In that way, once the two initial codes have been written in, any possibility of access from the outside to the two
30 memories is completely abolished with the consequent

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impossibility for anyone to get to know the two codes and thus to get to know the algorithm that has been used.

Moreover, the split of the current single rewritable memory into two memories, one of which is not rewritable, for example of the PROM type, for the identification code and the other
5 rewritable for the transmission code allows the identification code to be maintained in the first without any possibility of alteration, either intentional or deriving from disturbances of various types.

10 Again according to the invention the receiver comprises at least one memory for said identification code and at least one rewritable memory for said variable transmission code, the second of which is included together with said microprocesor of the receiver inside a first sealed container, while the first
15 is included inside a second sealed container separate from the first and connected to it.

In this way, the continuous exchange of information does not take place between the microprocessor and the rewritable memory that in the known receivers can lead to the alteration of the
20 identification codes memorized during the installation step.

These and other objects, characteristics and advantages of the present invention will be made more evident by the following detailed description of a possible embodiment thereof illustrated as a non-limiting example in the enclosed drawings,
25 wherein:

Fig. 1 shows a diagrammatic representation of the transmitter of a device according to the invention;

Fig. 2 shows a diagrammatic representation of the receiver of a device according to the invention.

30 The device illustrated in the drawings comprises a

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transmitter T (Fig. 1) and a receiver R (Fig. 2) that can be connected together by wireless, by telephone, by optical means, by direct contact or by any other manner.

The transmitter T of Fig. 1 comprises, inside a single sealed container C1, a non re-writable memory of the PROM type, denominated ID, for memorizing an identification code of the transmitter and a rewritable memory, denominated D, for memorizing a variable transmission code that at each transmission varies according to a preset cyclical sequence.

As can be seen, the two memories ID and D are separate one from the other and totally inaccessible from the outside of the container C, so as not to influence one another reciprocally and not to allow the knowledge of the two codes, in particular that of identification, on the part of non-authorized personnel.

The content of the two memories ID and D is, on the other hand, available to a microprocessor M1 with a preset algorithm, that can be activated by means of an external pushbutton P for processing the two abovementioned codes in a suitable manner and to insert them, preferably in an encrypted form, in a string of data S emitted by the transmitter T as the signal destined for the receiver R. The microprocessor M1 also updates the rewritable memory D.

The receiver R of Fig. 2 in turn comprises, inside a sealed container C2, a microprocessor M2 suitable for receiving the string of data S emitted by the associated transmitter T and a plurality of rewritable memories, denominated D1-Dn, for memorizing a variable transmission code that at each transmission varies according to a preset cyclical sequence.

There is also a separate container C3, that contains a

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plurality of memories, denominated ID1-IDn, in which the respective identification codes of the enabled transmitters are pre-memorized during the installation step.

5 The microprocessor M2 receives the string of data S from a transmitter T and, after processing it, compares it with the identification codes contained in the memories ID1-IDn and with the transmission codes contained in the memories D1-Dn, each of which is associated with a respective memory ID1-IDn.

10 In the case where the identification code received corresponds to one of the codes contained in the memories ID1-IDn and if the variable transmission code received is one of those immediately subsequent to the last one memorized, the microprocessor M2 emits an operating signal SC for the utility operated by it.

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C L A I M S

1. Electronic device for the operation of utilities such as burglar-alarm units, door-openers, switches and so on, comprising a transmitter (T) and a receiver (R), the
5 transmitter (T) comprising at least one memory for storing a fixed identification code and a variable transmission code and a microprocessor (M1) with a preset algorithm for the formation and emission of a string of data containing said codes, the
10 receiver (R) comprising at least one memory for storing at least one fixed identification code and at least one variable transmission code coincident with a previous variable transmission code received from the receiver and a
microprocessor (M2) with a preset algorithm for comparing the
15 string of data received with said identification code and said variable transmission code stored in said memory of the receiver, characterized in that said memory of the transmitter (T) is constituted by a non-rewritable memory (ID) for said
identification code and by a rewritable memory (D) for said
variable transmission code, both memories (ID, D) being
20 included together with said microprocessor (M1) of the transmitter (T) inside a single sealed container (C1) suitable for preventing access to the algorithm of said microprocessor (M1) and to the content of said memories (ID, D).

2. Device according to claim 1, characterized in that said
25 non-rewritable memory (ID) of the transmitter (T) is of PROM type.

3. Device according to claim 1, characterized in that said
memory of the receiver (R) is constituted by at least one
memory (ID1-IDn) for said identification code and by at least
30 one rewritable memory (D1-Dn) for said variable transmission

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code, the second (D1-Dn) of which is included together with
said microprocessor (M2) of the receiver (R) inside a first
sealed container (C2), while the first (ID1-IDn) is included
inside a second sealed container (C3) separate from the first
and connected to it.

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"Electronic device for the operation of utilities such as burglar-alarm units, door-openers, switches and so on".

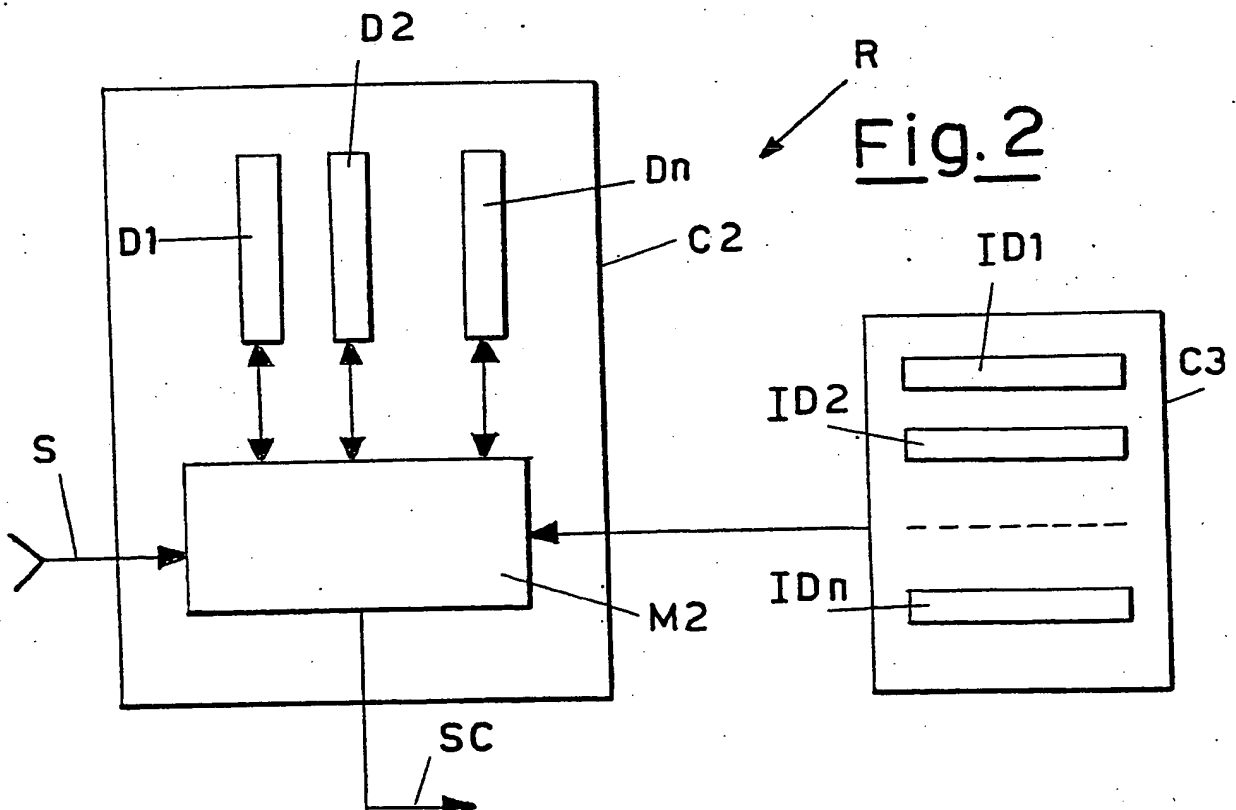
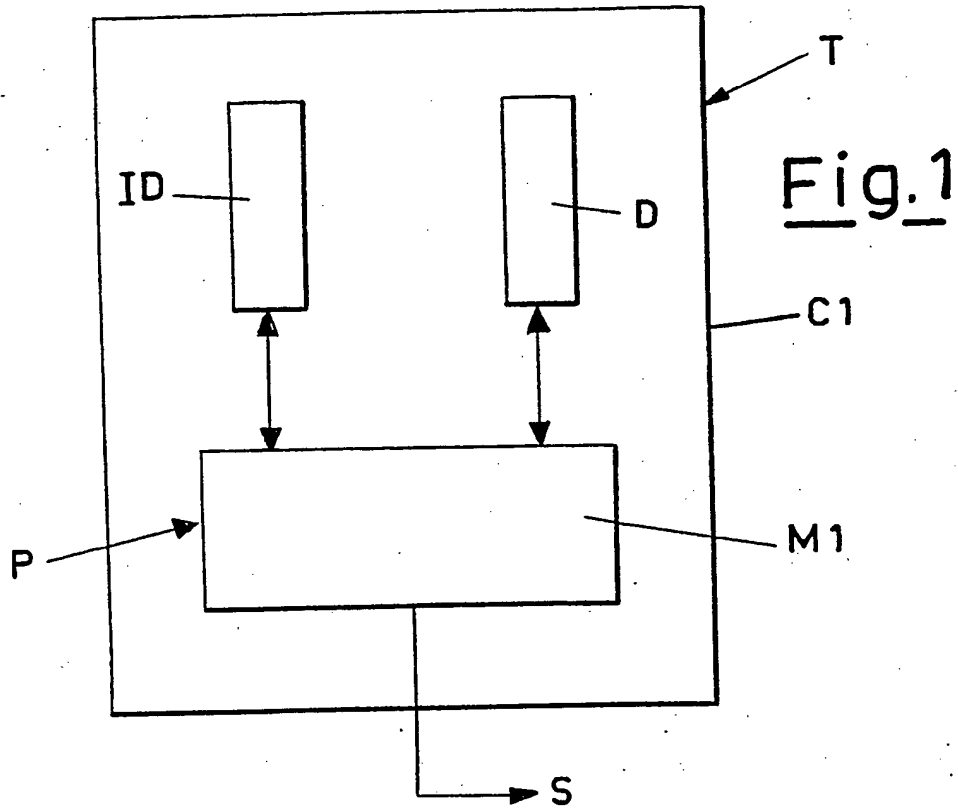
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ABSTRACT

5 The device comprises a transmitter (T) and a receiver (R).
The transmitter (T) comprises one non-rewritable memory (ID)
for storing a fixed identification code, a rewritable memory
(D) for storing a variable transmission code and a
microprocessor (M1) with a preset algorithm for the formation
10 and emission of a string of data containing said codes. The
receiver (R) comprises at least one memory (ID1-IDn) for
storing at least one fixed identification code, at least one
rewritable memory (D1-Dn) for storing at least one variable
transmission code coincident with a previous variable
15 transmission code received from the receiver and a
microprocessor (M2) with a preset algorithm for comparing the
string of data received with said identification code and said
variable transmission code stored in said memories (ID1-IDn;
D1-Dn) of the receiver. Both memories (ID, D) of the
20 transmitter (T) are included together with the corresponding
microprocessor (M1) inside a single sealed container (C1)
suitable for preventing access to the algorithm of said
microprocessor (M1) and to the content of said memories (ID,
D).

(Fig. 1)

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 94/04179

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G08C19/28 E05B49/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G08C E05B G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PATENT ABSTRACTS OF JAPAN vol. 16, no. 422 (M-1305) 4 September 1992 & JP,A,04 143 386 (CASIO COMP CO LTD) see abstract ---	1-3
Y	IBM TECHNICAL DISCLOSURE BULLETIN., vol.23, no.7A, December 1980, NEW YORK US pages 2960 - 2961 D.E.SCHREIBER 'DATA AND PROGRAM SECURE MICROPROCESSOR SYSTEM' see the whole document ---	1-3
A	EP,A,0 385 070 (DAIMLER-BENZ AKTIENGESELLSCHAFT) 5 September 1990 see the whole document --- -/--	1-3

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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A	<p>EP,A,0 509 567 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) 21 October 1992 see page 3, column 4, line 6 - line 36; figure 1</p> <p>-----</p>	1-3

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0385070	05-09-90	DE-A- 3905651	30-08-90
		ES-T- 2051390	16-06-94
		JP-A- 2250497	08-10-90
		US-A- 5159329	27-10-92
EP-A-0509567	21-10-92	JP-A- 5088986	09-04-93

